DOCUMENT RESUME

ED 066 477 TM 001 961

TITLE	Systems Analyst Business Electronic Data Processing (profess. & kin.) 0-69.985--Technical Report on Standardization of the General Aptitude Test Battery.
INSTITUTION	Manpower Administration (DOL), Washington, D.C. U.S. Training and Employment Service.
REPORT NO	TR-S-315
PUB DATE	Nov 64
NOTE	7p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Aptitude Tests; Business; *Cutting Scores; Electronic Data Processing; Evaluation Criteria; Job Applicants; *Job Skills; Norms; Occupational Guidance; *Personnel Evaluation; *Systems Analysts; Test Reliability; Test Validity
IDENTIFIERS	GATB; *General Aptitude Test Battery

ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

ED 066477

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

SYSTEMS ANALYST, BUSINESS ELECTRONIC DATA PROCESSING (profess. & kin.) 0-69.985

B-595 S-375

(Supersedes B-558)

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TM 001 961

U. S. Employment Service
in Cooperation with
Wisconsin State Employment Service

November 1964

GATB #2464

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

SYSTEMS ANALYST, BUSINESS ELECTRONIC DATA PROCESSING 0-69.985

B-595 5-375

Summary

The General Aptitude Test Battery, B-1002B, was administered to a final sample of 55 men and women employed as Systems Analyst, Business Electronic Data Processing 0-69.985 by various companies in the Milwaukee, Wisconsin area which are affiliated with the Data Processing Management Association. The criterion consisted of supervisory ratings. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes G-Intelligence, V-Verbal Aptitude, N-Numerical Aptitude and S-Spatial Aptitude were selected for inclusion in the final test norms.

GATB Norms for Systems Analyst, Business Electronic Data Processing 0-69.985, B-595.

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1- H CB-1- I CB-1- J	125	G	Part 3 Part 4 Part 6	120
V	CB-1- J	105	V	Part 4	105
N	CB-1- D CB-1- I	115	N	Part 2 Part 6	110
S	CB-1-F CB-1-H	110	S	Part 3	105

Effectiveness of Norms

The data in Table IV indicate that only 74 percent of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 90 percent would have been good workers. 26 percent of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 10 percent would have been poor workers.

TECHNICAL REPORT

I. Purpose

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Systems Analyst, Business Electronic Data Processing 0-69.985.

II. Sample

During the period April 17, 1962 through July 1, 1963 the General Aptitude Test Battery, B-1002B, was administered to a sample of 55 men and 3 women employed as Systems Analysts 0-69.985. The following companies in the Milwaukee, Wisconsin area which are affiliated with the Data Processing Management Association participated in the study:

Name of Company	Number Tested
Allis Chalmers Manufacturing Co.	15
American Motors Corporation	3
Badger Mutual Insurance Co.	1
First Wisconsin National Bank	5
Harnishchfaeger Corporation	4
Heil Company	1
Johnson Service Company	4
Marine National Exchange Bank	2
George J. Meyer Manufacturing Co.	2
Northwestern Mutual Life Insurance Co.	5
Joseph Schlitz Brewing Co.	3
Square D Co.	3
West Bend Aluminum Co.	1
Wisconsin Electric Power Co.	4
Wisconsin Telephone Co.	5
	58

Three individuals tested were eliminated from the final sample because their job duties were not comparable to those of the other individuals in the sample. Therefore, the final sample consisted of 55 individuals; 52 men and 3 women.

Systems Analysts are selected by most companies by promotion from within, generally from the occupations of Methods Analyst or Programmer. The Systems Analyst receives 12 months of on-the-job training and in some cases IBM computer school training. All workers in this sample had completed their training and, in addition, had at least 2 months of experience. All of the workers had at least a high school education. Those employed more recently by the companies tended to have at least 4 years of college. Those with only a high school education had received several promotions before becoming a Systems Analyst.

TABLE I

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

N = 55	M	σ	Range	r
Age (years)	33.3	7.7	22-51	.164
Education (years)	14.3	2.1	12-19	.361**
# Experience (months)	33.2	26.5	2-115	.064

**Significant at the .01 level
#12 months of on-the-job training not included.

III. Job Description

Job Title: Systems Analyst, Business Electronic Data Processing (profess. & kin.) 0-69.985

Job Summary: Analyzes electronic data processing problems, such as the development of intergrated production, inventory control and cost analysis systems, to devise complete operating systems by determining the project's applicability to the computer system, and by estimating cost, efficiency, and programming problems.

Work Performed: Analyzes problems in terms of equipment capabilities to determine techniques and to formulate computer system requirements most feasible for processing data. Estimates cost, time, equipment and personnel required for programming a new problem by comparing problem requirements to equipment and personnel capacities, or estimates proposed cost and time required for programming a new problem by determining equipment and personnel required. Outlines the defined problem for use by the Programmer in preparing flow charts and computer instructions by preparing block diagrams interpreting the specifications. Reviews proposed systems in terms of equipment, procedures, etc., to ascertain that the system is as efficient and sophisticated as possible. Consults with personnel in other areas of company operations concerning objectives and intermediate results as work progresses.

Trains new personnel, by lecture and demonstration, in the procedures required in the analysis, programming and coding of a problem. Exercises general supervision of personnel for analysis, programming and coding of a problem. May give direct supervision and assistance when requested. May assume duties of personnel performing analysis, programming or coding for the more difficult problems.

IV. Experimental Battery

All the tests of the GATB, B-1002B , were administered to the sample group.

V. Criterion

The criterion data collected consisted of two sets of independent ratings made by the first-line supervisor on USES Form SP-21, "Descriptive Rating Scale." A period of at least two weeks elapsed between the first and second ratings. The rating scale consisted of nine items covering different aspects of job performance, with five alternatives for each item. Weights of one through five, indicating the degree of job proficiency attained, were assigned to the alternatives. A reliability coefficient of .93 was obtained for the criterion. Therefore, the two sets of ratings were combined, resulting in a distribution of final criterion scores of 57-88 with a mean of 75.0 and a standard deviation of 7.5.

VI Qualitative and Quantitative Analyses

A. Qualitative Analysis

On the basis of the job analysis data, the following aptitudes were rated "important" for success in this occupation:

Intelligence (G) - required to learn complete operation of electronic data processing system and company operations in order to analyze the problems to be solved and to devise procedures to process the data.

Verbal Aptitude (V) - required to comprehend scientific and technical terminology and to develop written and oral instructions for processing data.

Numerical Aptitude (N) - required to understand mathematical principles in order to estimate cost, time, equipment and personnel involved in solving a problem.

Spatial Aptitude (S) - required to visualize block diagrams for programming set up and to analyze the functioning of the computer.

Clerical Perception (Q) - required to check the accuracy of data and to avoid making errors in written instructions.

B. Quantitative Analysis:

TABLE II

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB; N = 55

Aptitudes	M	σ	r
G-Intelligence	133.2	13.2	.427**
V-Verbal Aptitude	123.2	14.4	.472**
N-Numerical Aptitude	131.7	13.2	.306*
S-Spatial Aptitude	123.0	14.0	.030
P-Form Perception	118.2	12.8	-.103
Q-Clerical Perception	126.4	15.6	.320*
K-Motor Coordination	117.5	14.4	.026
F-Finger Dexterity	107.4	18.8	-.130
M-Manual Dexterity	108.0	22.2	-.115

**Significant at the .01 level
*Significant at the .05 level

C. Selection of Test Norms:

TABLE III

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important	X	X	X	X		X			
Irrelevant									
Relatively High Mean	X		X			X			
Relatively Low Sigma	X		X	X	X				
Significant Correlation with Criterion	X	X	X			X			
Aptitudes to be Considered for Trial Norms	G	V	N	S		Q			

Trial norms consisting of various combinations of Aptitudes G, V, N, S and Q with appropriate cutting scores were evaluated against the criterion by means of the Phi Coefficient technique. The objective of this analysis was to obtain a set of norms which was statistically valid and, from a job analysis point of view, consistent with norms for other automatic data processing occupations. Consequently, B-1002 norms consisting of G-120, V-105, N-110 and S-105 were selected.

VII. Validity of Norms (Concurrent)

The validity of the norms was determined by computing a Phi Coefficient between the test norms and the criterion and applying the Chi Square test. The criterion was dichotomized by placing 26 percent of the sample in the low criterion group because this percent was considered to be the unsatisfactory or marginal workers.

Table IV shows the relationship between test norms consisting of Aptitudes G, V, N and S with critical scores of 120, 105, 110 and 105, respectively, and the dichotomized criterion for Systems Analyst, Business Electronic Data Processing 0-69.985. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Validity of Test Norms for
Systems Analyst, Business Electronic Data Processing 0-69.985
(G-120, V-105, N-110, S-105)

N = 55	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	4	37	41
Poor Workers	10	4	14
Total	14	41	55

Phi Coefficient = .62
X^2 = 20.938
P/2 < .0005

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

VIII. Conclusions

On the basis of the results of this study, Aptitudes G, V, N and S with minimum scores of 120, 105, 110 and 105, respectively, have been established as B-1002 norms for Systems Analyst, Business Electronic Data Processing 0-69.985. The equivalent B-1001 norms consist of G-125, V-105, N-115 and S-110.

IX. Determination of Occupational Aptitude Pattern

The data for this study met the requirements for incorporating the occupation studied into OAP-1 which is shown in Section II of the Guide to the Use of the General Aptitude Test Battery, January 1962.